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Corso di Laurea Magistrale in Ingegneria Chimica

TESI DI LAUREA

"Influence of GDC on the performance of composite cathode LSCF:GDC for Solid Oxide Fuel Cells"

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Abstract

This work is focused on the study of composite cathode LSCF/GDC. The aim is to understand the role of the GDC in the improved performance of the composite cathode compared to the pure LSCF one. Two different hypothesis have been elaborated in order to explain the better performance: the presence of GDC could enhance the ionic conductivity or it could have a catalytic effect or both. In order to understand which of these aspects could be influent, different designs of cathode have been manufactured. LSCF cathode has been used as reference and compared with the performances of a composite LSCF/GDC cathode, a LSCF impregnated with GDC one and a composite LSCF/GDC impregnated with GDC cathode. The impregnation has been carried out in order to verify the catalytic action of GDC. Symmetrical cells produced with these configurations have been submitted to electrochemical testing and microstructural analysis.

From the results obtained the improved performance of the composite compared with the pure LSCF has been confirmed; however the impregnation did not bring any improvement in the performance, suggesting the conclusion of no catalytic effect of the GDC. In any case further development of this study using a higher load of GDC and/or GDC particles with smaller size would be beneficial in order to confirm this result.

The tests on the cells were carried out also after 140 hours and it has been seen that the impregnated cathodes present a stable performance, whereas the composite not impregnated shows a worsening of performance. This behaviour suggests that the presence of deposited GDC particles stabilizes the cathode.

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